

Value Creation in the Product Development Process

January 31, 2002

Lean Aerospace Initiative

A graphic featuring an orange planet with a thin blue ring, positioned at the bottom left. A thick, orange, curved line swooshes from the planet, arching over the text 'Aerospace' and ending near the top right of the slide.

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LAI Value Creation Model

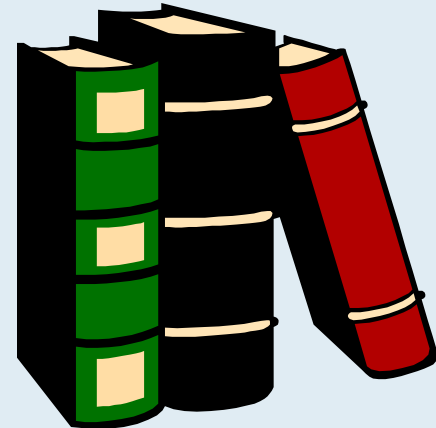


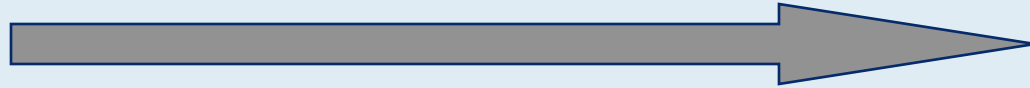
To define and analyze value delivery in the product development (PD) process

- **To improve the PD process, one must understand and quantify value creation**
- **Value is difficult to define**
- **Models can handle complex PD processes, but do not consider value**
- **Methodology for assessing value creation offers potential to guide PD process enhancement**



- **Part I: Background**
- **Part II: Framework**
- **Part III: Data Collection**
- **Part IV: Results**



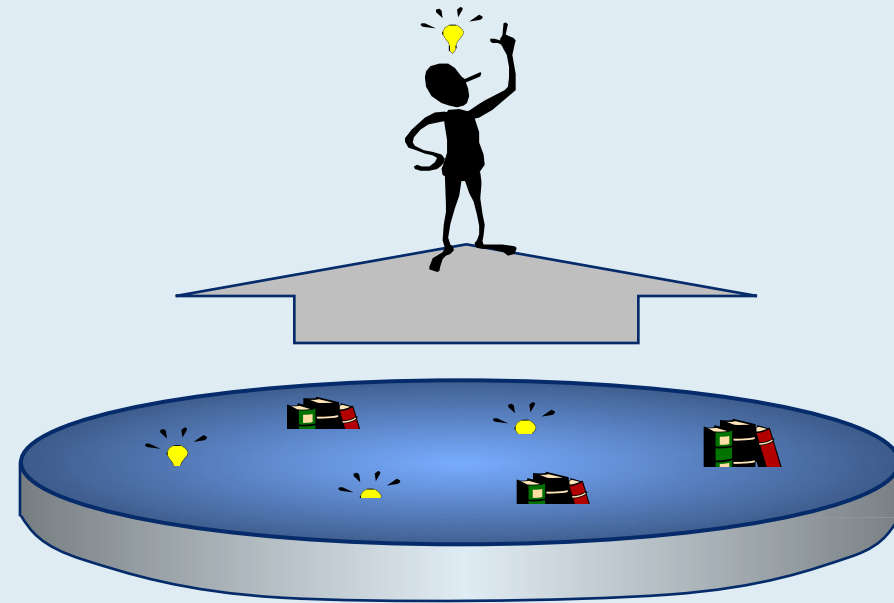


Product-Centered	Process-Centered
<p>Value is a measurement of the usefulness, importance, availability, and cost of the product. (Slack, 1998)</p>	<p>Value is anything that directly contributes to the form, fit, or function of the build-to package. (LAI, 1998)</p>
<p>1961 Miles, Kaufman, Shillito & DeMarle, Womack & Jones, Slack</p>	<p>1998 McManus, Browning, Deyst 2001</p>

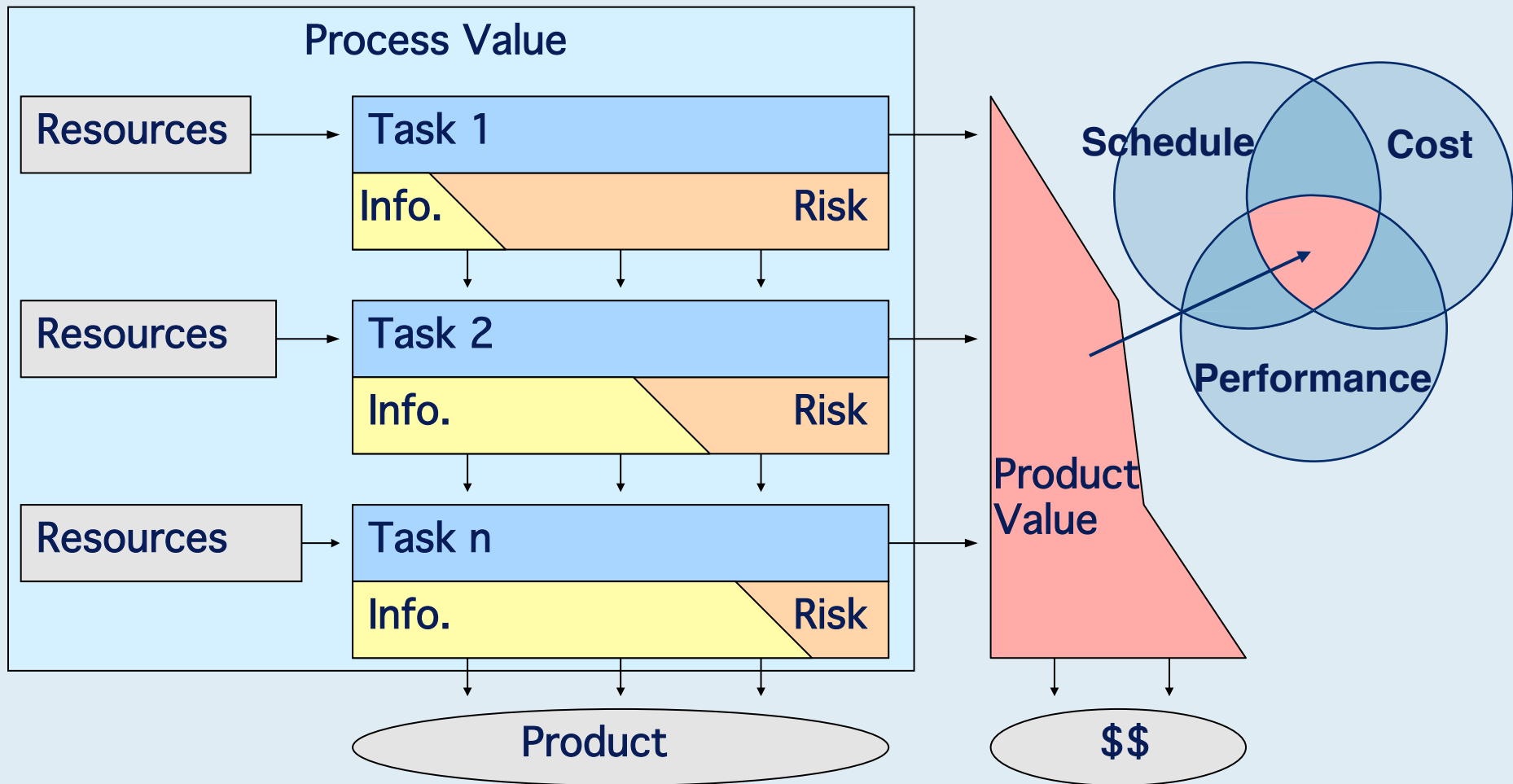
The definition of value in product development has evolved from being product-centered to process-centered.

- Part I: Background
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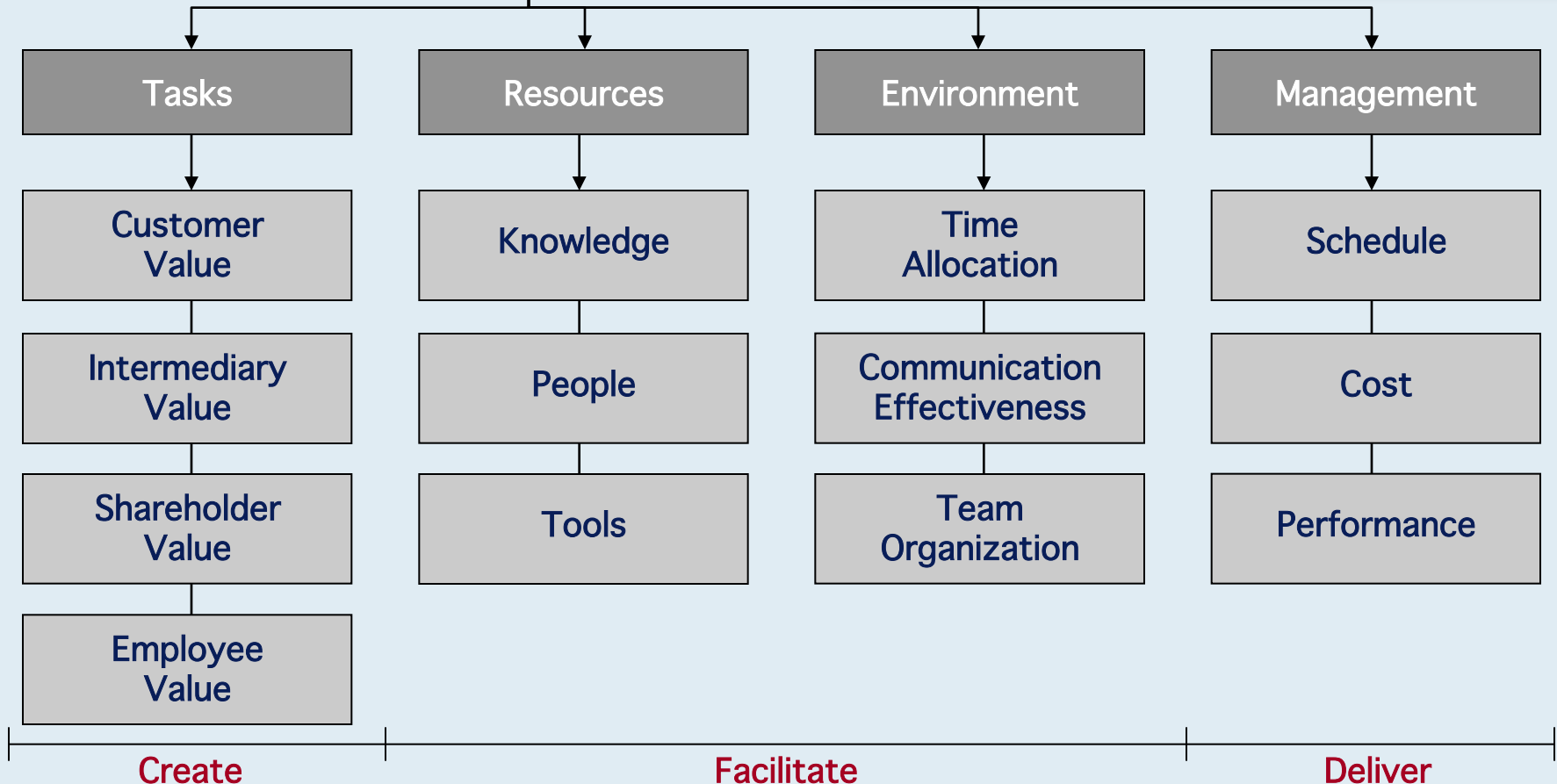
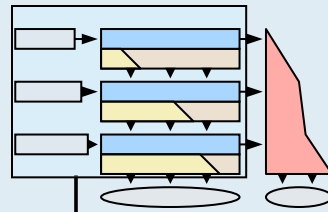
Framework



**Literature review and
early site visits**



Extended Framework for Value Creation



Value is the contribution of tasks, resources, environment, and management to the PD process.

	Perspective	Attribute: Task contributes to...
Enterprise Value	Customer	V1. Functional performance of end product
		V2. Definition of processes to deliver product
		V3. Reduction of risks and uncertainties
	Intermediary	V4. Form of final output
		V5. Facilitating communication
		V6. Enabling other tasks
	Shareholder	V7. Cost and/or schedule emphasis
		V8. Learning or resource improvement
	Employee	V9. Employee job satisfaction
	Government, supplier, end-user, etc.	V10. Other

Tasks are the principal building blocks of value.



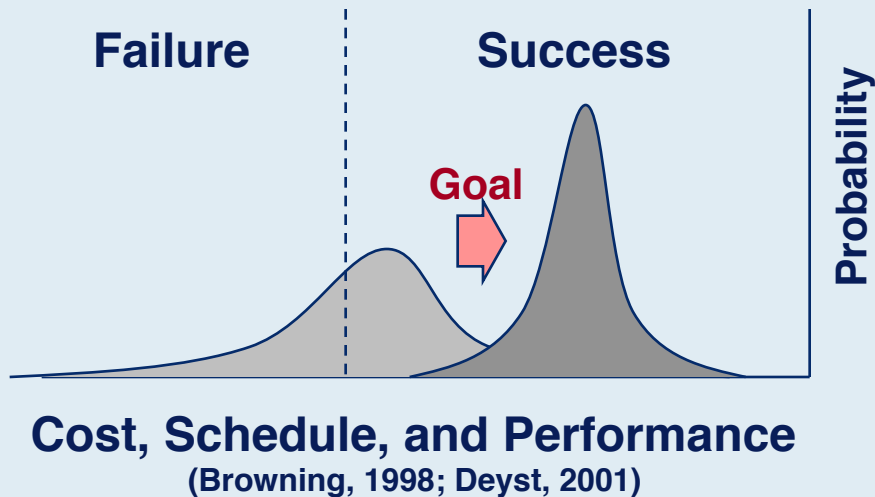
Resource Attributes		
Knowledge	People	Proficiency
		Diversity
		Empowerment
		Mentorship
		Leadership
	Tools	Knowledge application
		Information gathering

Resource value is the integration of people and tools to create organizational knowledge.



Environment Attributes	
Time Allocation	Knowledge application
	Information gathering
	Other activities
Communication Effectiveness	Technical work
	Process related work
	Team building
Team Organization	Geographic location
	Office layout

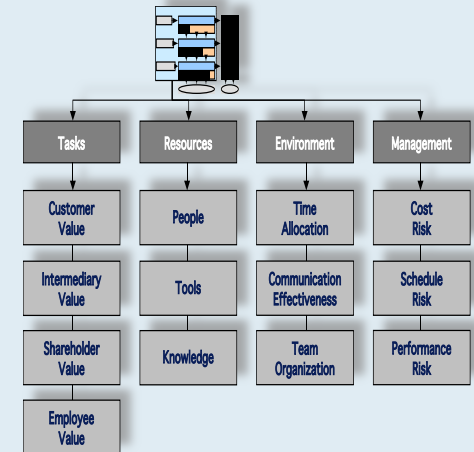
Environmental value promotes value-added activities and effective communication.



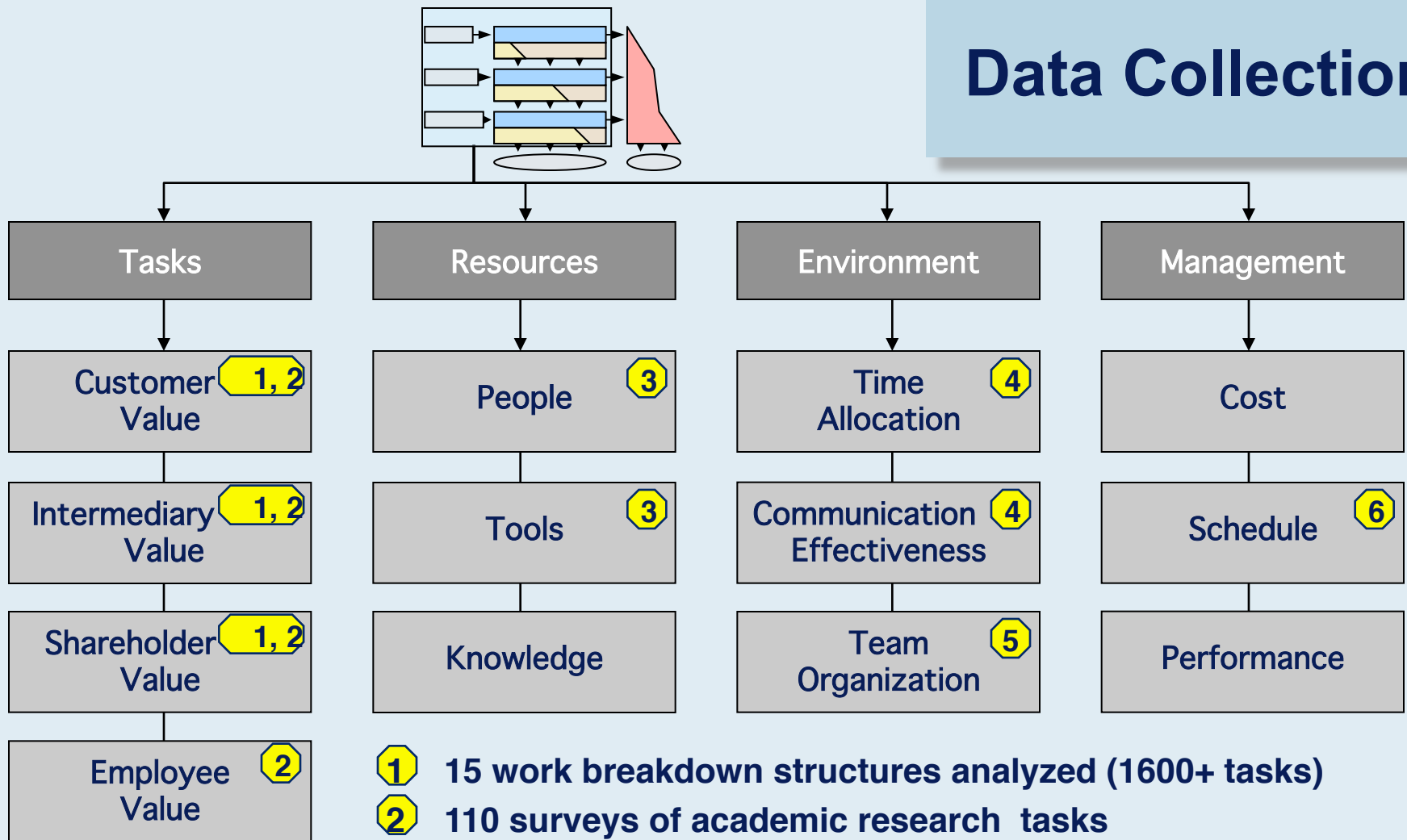
Management Attributes	
Cost	Desired value
	Reserve
	Estimate & uncertainty
Schedule	Desired value
	Reserve
	Estimate & uncertainty
Perform.	Desired value
	Reserve
	Estimate & uncertainty

Management value is the effective management of cost, schedule, and performance.

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Data Collection

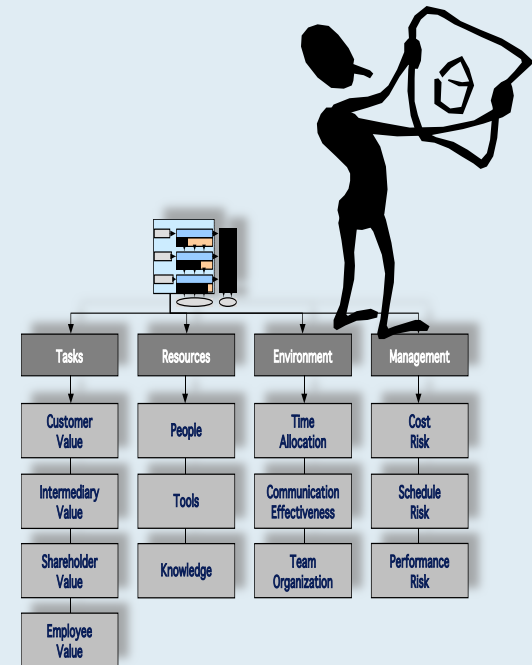


- ①** 15 work breakdown structures analyzed (1600+ tasks)
- ②** 110 surveys of academic research tasks
- ③** 80 industry interviews of PD resources
- ④** 59 surveys on time allocation and communication
- ⑤** 3 brief case studies on the environments of successful teams
- ⑥** 4 teams (235 tasks) analyzed by schedule completion

Summary of Industry Programs Visited

Organizations		# of Programs	Method of Data Collection					
			1	2	3	4	5	6
A	Commercial	5	√		√	√		√
B	Commercial	8	√		√	√	√	√
C	Commercial	3	√		√	√		
D	Commercial	1			√	√		
E	Government	2	√		√	√	√	
F	Government	2			√	√		
G	Commercial	1	√		√	√		
I	MIT	6		√				

- **Part I: Background**
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Work Breakdown Structures

**14 WBS' s (1600 tasks)
evaluated for value(s)
contributed to program**

Task contributes to...	
Customer Value	V1. Functional performance of end product
	V2. Definition of processes to deliver product
	V3. Reduction of risks and uncertainties
Intermediary Value	V4. Form of final output
	V5. Facilitating communication
	V6. Enabling other tasks
Shareholder Value	V7. Cost and/or schedule emphasis
	V8. Learning or resource improvement
Employee Value	V9. Employee job satisfaction
Other Value	V10. Other

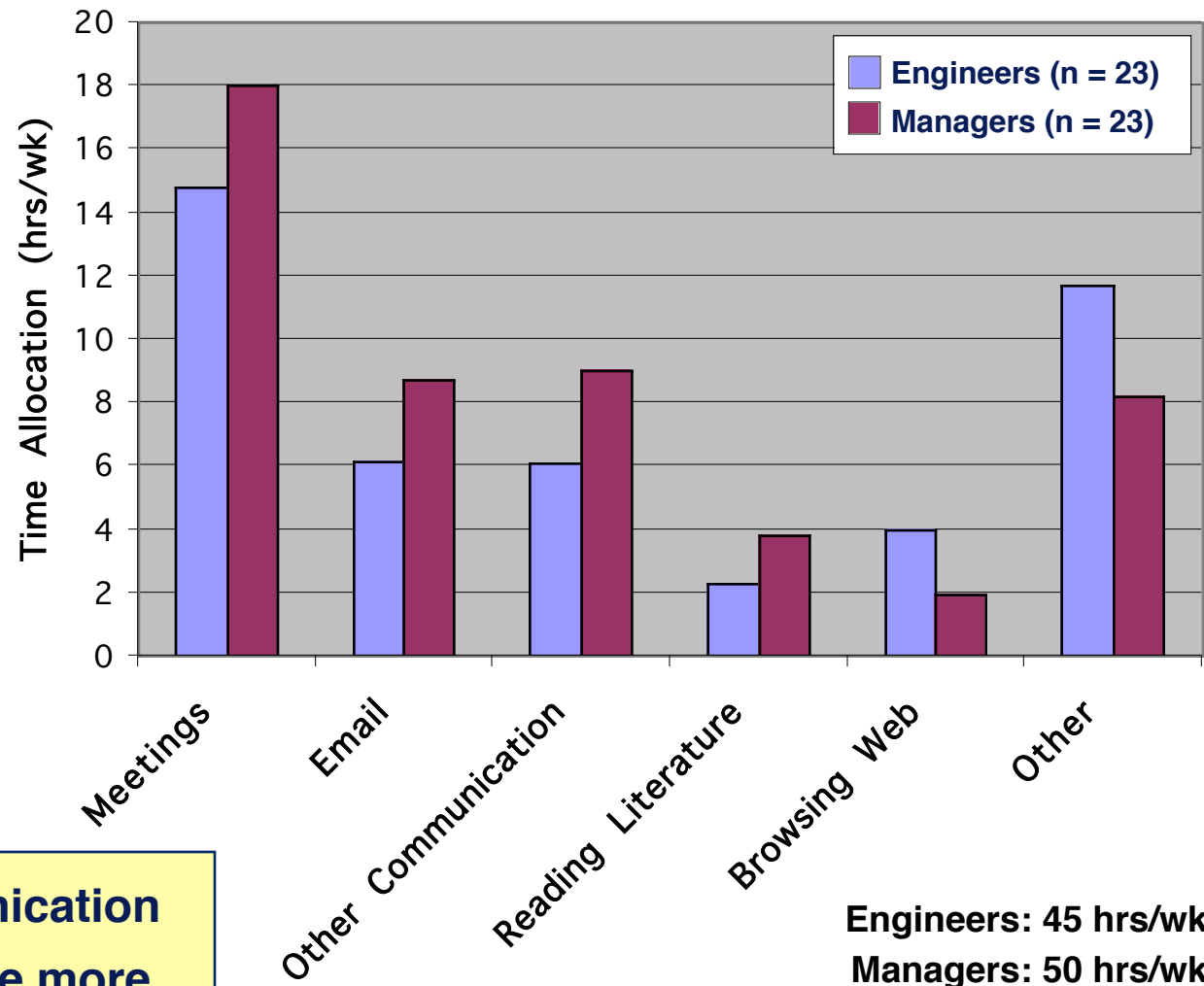
- **86% of tasks in high-level (program) WBS' s address customer value**
- **At lower level (process WBS), more tasks are enabling or supplemental**
- **Correlation of WBS breakdown with observed lean awareness shows more emphasis on communication and cost/schedule tasks**

Engineering Time

- 33% on meetings
- 14% on email
- 9% on web
- 5% reading lit.
- 26% on “other”

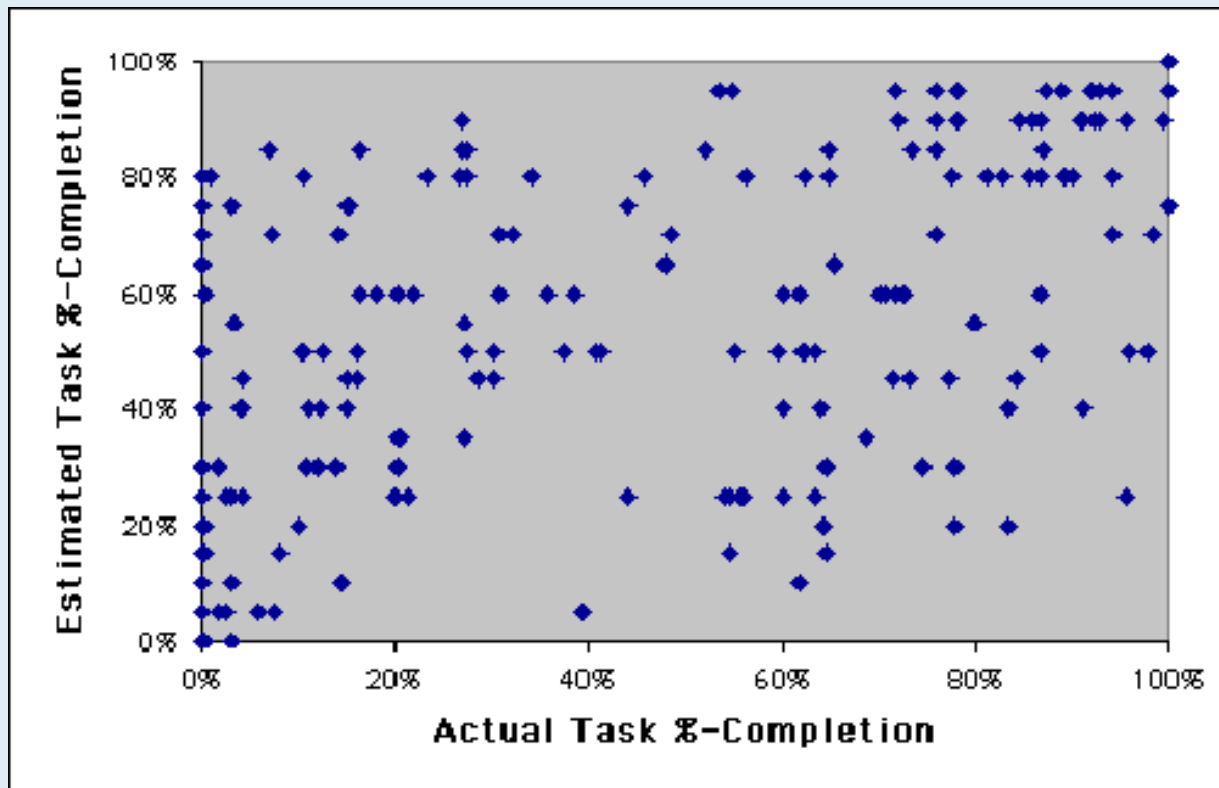
**This result suggests
at least a 3:1 ratio of
communication
versus isolated work**

**Thus, improving communication
effectiveness may provide more
PD value than improving tasks.**



In-Process Task Completion

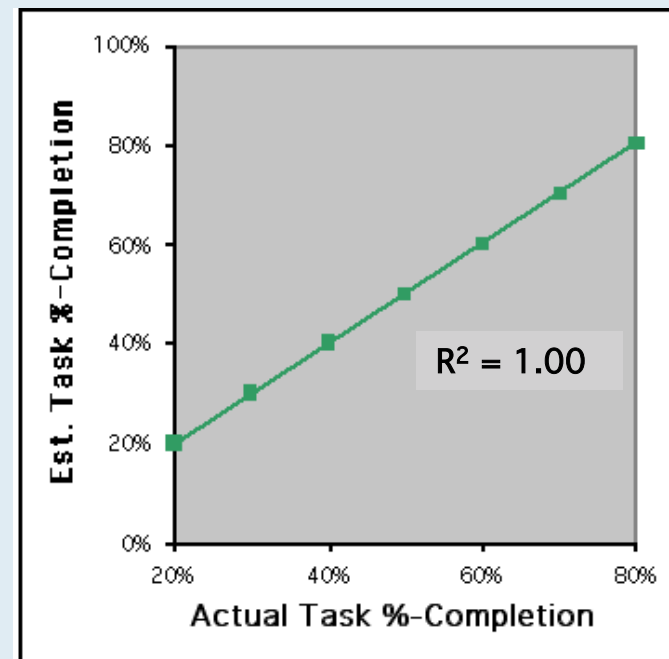
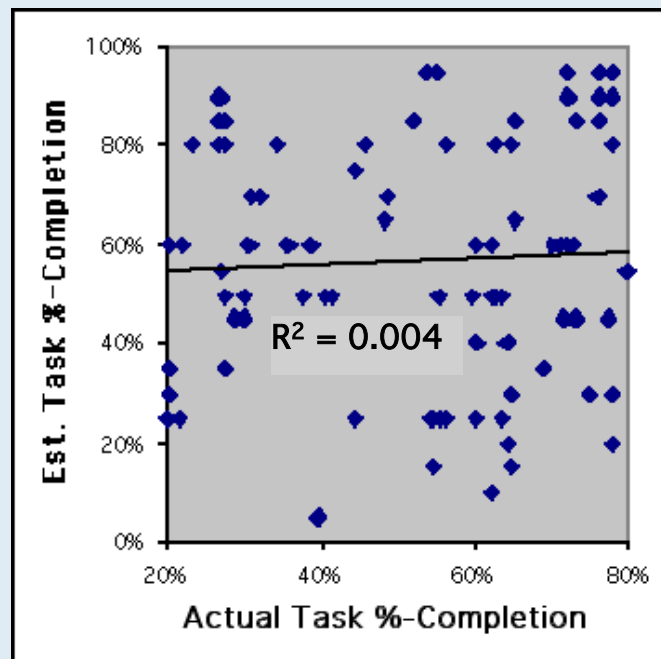
Estimated vs. Actual Completion (Gantt chart approach)



Progress in PD is difficult to estimate accurately.

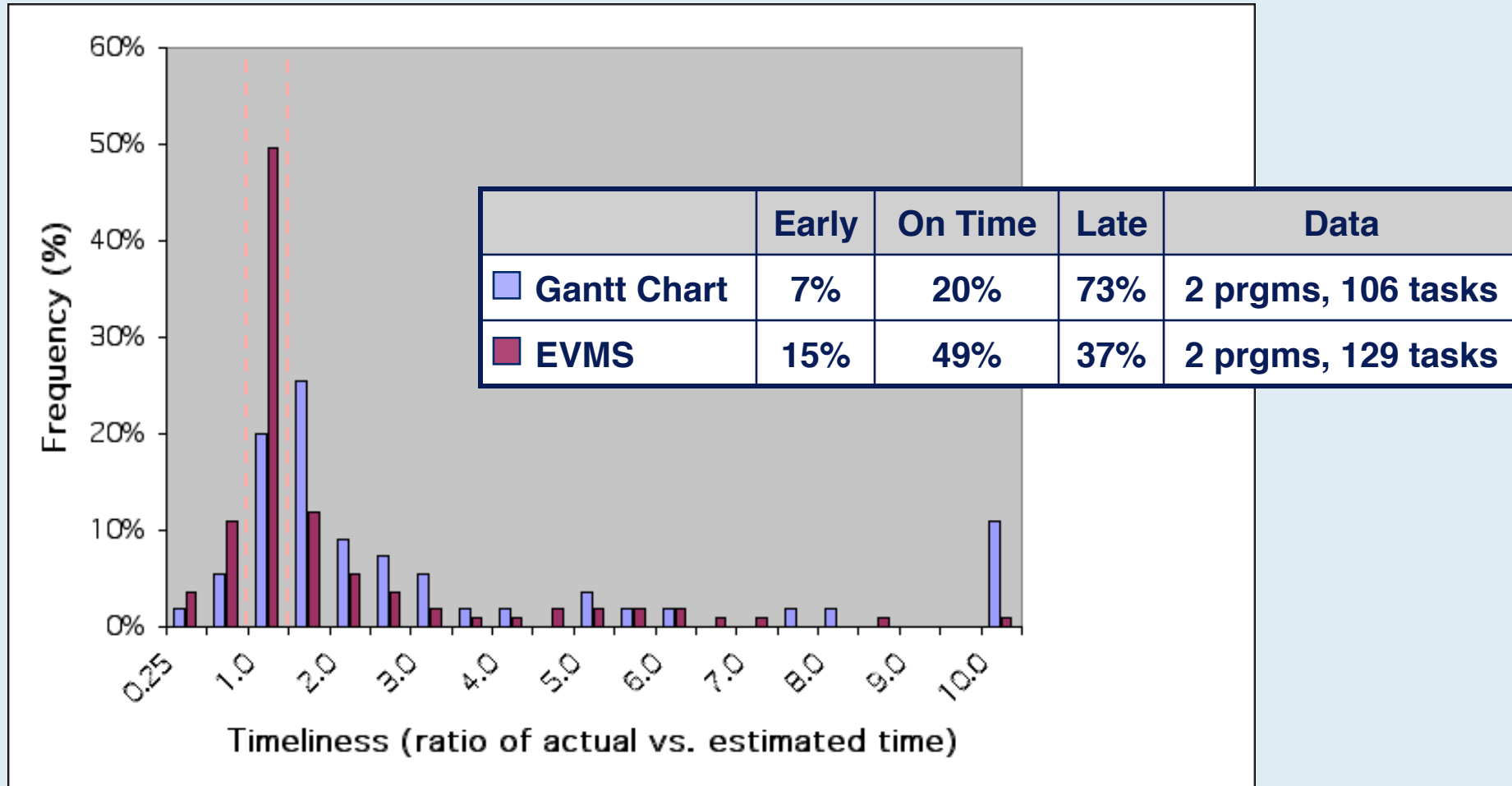
PD versus Manufacturing

Comparison of Product Development to Manufacturing

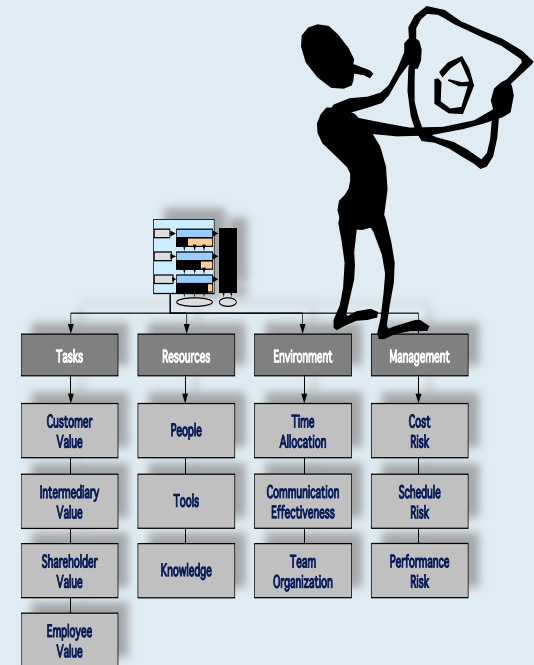


Toyota, adapted from Spear & Bowen (1999)

Histogram of Product Development Task Completion



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Summary of Results

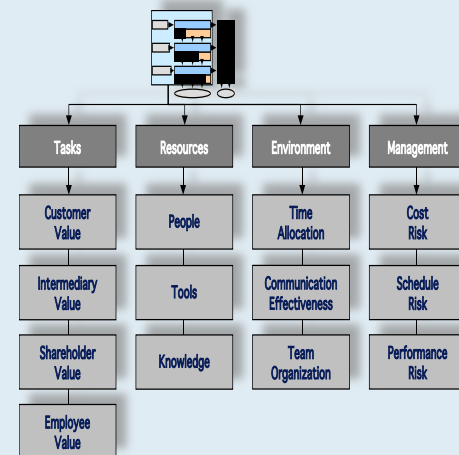
- **PD value has shifted from product-centered to process-centered**
- **PD value may be decomposed into tasks, resources, environment, and management**
- **WBS Analysis-**
 - **Variety of WBS' s suggests that there is no single solution for defining value in PD**
 - **Programs with lean awareness incorporate more enabling tasks than traditional programs**
- **Comm. Survey-**
 - **Time allocation data suggests that there is at least a 3:1 ratio of communication versus isolated work**
- **Task Completion-**
 - **Progress in PD is difficult to estimate accurately**
 - **An EVMS approach contributes to more effective schedule mgmt. than solely using a Gantt chart**

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Questions?



Thesis located at LAI website: http://lean.mit.edu/Publications/pub_db/files_public/TH_Chase.pdf